

# AT HOME IN THE RIVER

## (Aquatic Species)

### *A Water Resource Education Unit*

**CONCEPT:** The New River provides a home (habitat) to many aquatic species which depend on the quality of the water for survival.

**PURPOSE:** This unit gives students the opportunity to see and learn several aquatic insects and their importance as water quality indicators.

**OBJECTIVES:** Students will be able to:

1. identify several aquatic species
2. state how water quality affects their survival
3. learn how aquatic insects can determine the quality of the water

**CURRICULUM ACTIVITIES:**

1. At Home In The River  
(ranger program)

2. Water Journal

3. Macro Memory

4. Water Monitoring

**SUBJECT AREA:**

Science

Writing, Language Arts

Science

Science, Math



New River Gorge National  
River

# AT HOME IN THE RIVER

## (Aquatic Species)

### OVERVIEW

#### **The Aquatic Environment:**

Good water quality means that the water is clean enough to support aquatic life and other beneficial uses. Good water quality is important to the health of a stream or rivers aquatic environment. An aquatic environment must provide adequate shelter for the plants and animals that live there and support a diverse and healthy population of organisms. To assess the health of a stream and its environment, one must evaluate the physical characteristics of a waterway's habitat. The availability of good habitat determines what organisms will be able to survive in a particular environment<sup>1</sup>.

An aquatic habitat is affected by the amount of water flow, tree cover along the bank, and the presence of pools and riffles. The volume of water flow of a stream or river is critical to the types of aquatic life that can survive there<sup>2</sup>. Measuring stream flow can help determine minimum in-stream flow so that withdrawals of water do not jeopardize the amount of water required for boating or fish habitat. Pools trap nutrients important to the food chain. Riffles provide hiding places for aquatic insect larvae and fish. They also play a valuable role in oxygenating the water. As water bubbles over rocks, it interacts with air trapping and dissolving oxygen into the water.

Physical characteristics of the stream, such as the presence of shade trees, riffles and pools, are easy characteristics to identify and should be noted. Good habitat is essential to good water quality and the abundance of wildlife.<sup>2</sup>

#### **Biological monitoring:**

Also important to the health of an aquatic habitat is the diversity and population of aquatic species. Every organism has particular environmental requirements for it to be healthy and reproduce successfully<sup>1</sup>. The aquatic life present within a stream is a good indicator of the health of the stream and its environment. Through biological monitoring of a stream's benthic macroinvertebrates, one can determine stream health. The monitoring of living organisms provides data about water quality over time.

Benthic macroinvertebrates include aquatic insects, worms, shellfish, crustaceans, and other animals without backbones (invertebrate) that are large (macro) enough to see without a microscope and live at the bottom of a water body. Many species of mayfly nymphs, caddisfly larva, water pennies, and stonefly larva, for example, can survive only in swift, cool, well oxygenated water. Their presence at a sampling site is generally a sign of good water quality. Black fly larva, midges, leeches, and aquatic worms on the other hand,



are quite tolerant of pollution. They can be found in waters of both good and poor quality. If they are the only types of macroinvertebrates found at a site, chances are the site is silty and has low dissolved oxygen.<sup>1</sup>

Macroinvertebrates have different sensitivities to pollution. The three most pollution intolerant families of aquatic insects are the Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) — EPT<sup>1</sup>. At a monitoring site, the larger the percentage of pollution intolerant species found in relation to the tolerant species, the better the water quality.

By charting numbers and kinds of benthic macroinvertebrates found in a stream, you can determine if a stream is of excellent, good, fair, or poor quality. Biological monitoring is a very effective way to determine if a problem is present, because the presence or absence of different kinds of macroinvertebrates indicates a stream's health. Because macroinvertebrates generally complete their life cycle within a very small area, they can indicate water quality and land use effects on the stream at the specific location where you conduct your monitoring.<sup>2</sup>

Pollution intolerant (sensitive) macroinvertebrates include the caddisfly, mayfly, stonefly, hellgrammite, freshwater clams, water penny and riffle beetle. Pollution tolerant species include midges, crane fly, rat-tailed maggot, leeches, and pouch snails. A class of macroinvertebrates that can tolerate some pollution include crayfish, sowbugs, fingernail clams, damselflies, and dragonflies.

Fish and algae are other measures of water quality. Fish species also have different pollution tolerances and help indicate overall water quality. Trout are pollution sensitive and require an oxygen level of 6.0 mg/l or higher while carp are more tolerant to pollutants. Fisheries biologists compare the length of the fish to its weight, the heavier the fish for its length, the better the water condition<sup>1</sup>.

Excessive algae covering most rock surfaces in riffle areas indicate nutrient pollution. Fertilizer runoff, raw sewage, and soap discharges add nutrients (nitrates and phosphates) to the aquatic environment resulting in a rapid growth of algae. Once these nutrients are used up, the algae dies and begins to decompose using up dissolved oxygen needed by other organisms for survival. An excess of algae also blocks light to underwater plants and takes over macroinvertebrates' rock habitat<sup>2</sup>.

### **Some macroinvertebrates:**

Caddisfly — The caddisfly is closely related to moths and butterflies. Its larvae are often a large and important component of benthic communities and contribute significantly to the food chain of freshwater ecosystems<sup>3</sup>. Caddisflies themselves feed on plant material. Some obtain their food by shredding leaves and plant parts while others filter out the particles of shredded plants. Their mouthparts are adapted for chewing. Caddisfly larvae use tiny pebbles, grass, or twigs to build a tiny (case) home to enclose their soft bodies and keep them from being swept away in swift water. They need moderate to high levels of oxygen in order to survive. The adult emerges as a mothlike insect with two pairs of hairy wings and live between one or two months.

Dragonfly — The dragonfly nymph is a predator, feeding on other aquatic insects. Dragonfly larvae inhabit a variety of aquatic environments but are most commonly found in ponds, marshes, lake margins, and the slower reaches of rivers and streams<sup>3</sup>. The larvae propel themselves through the water by taking in and forcefully expelling water from the rectal chamber (jet propulsion)<sup>4</sup>. The adult lives on land and feeds on large numbers of insect pests, like the mosquito. It is often referred to as the "mosquito hawk."

Hellgrammite — The hellgrammite or dobsonfly larvae is a predator feeding on other aquatic insects. Their head possesses well-developed chewing mouthparts<sup>3</sup>. The larvae generally require a year to more than three years to complete growth. The larvae will migrate onto land where they prepare a cell in which to undergo transformation to the pupal stage. Hellgrammites have eight pairs of gills on their abdomen and can be found in clean, well oxygenated water<sup>4</sup>. They are one of the larger macroinvertebrates. The adult (dobsonfly) lives for only a few days. Anglers like to use the hellgrammite as fish bait.

Mayfly — As a group, mayflies are one of the most common and important members of the bottom dwelling freshwater community<sup>4</sup>. Mayfly nymphs collect food by gathering and filtering out the particles of plant material shredded by other insects. They are a preferred food for other insects and fish. Larval development ranges from a few weeks to as much as two years<sup>3</sup>. Adult mayflies live for no more than a month and are nonfeeding. Mayflies need high levels of oxygen and are often found in fast moving water. Mayflies are highly susceptible to pollution and are very useful in monitoring water quality.

Stonefly — Stoneflies get their name from the fact that they spend their brief life (two to three weeks) hiding or crawling among stones in or near fresh water. The stonefly nymph obtains its food by shredding leaves and plant parts. The mouthparts of the nymph are adapted for chewing plant material. They breathe through the surface of their skin or using gills along their sides under their legs. The larvae resemble mayfly nymphs but have two rather than three tails<sup>4</sup>. Stoneflies are a favorite food for trout. Stonefly nymphs generally live in the headwater streams. They are known as clean-water insects and are excellent indicators of water quality. They require high levels of oxygen to survive.

Water penny — Water pennies are flattened, round or oval-shaped creatures only 4-6 millimeters in size. They are commonly found attached to rocks where they graze for food, scraping algae off the rocks. When water pennies reach adulthood they become riffle beetles<sup>4</sup>. They need an oxygen rich environment in order to survive and are common in headwater streams.

1. *Adopt-A-Salmon Family: A Watershed Education Program for Middle School Students*. University of New Hampshire.
2. Firehock, Karen. *Hands On Save Our Streams*. Izaak Walton League of America, Gaithersburg, MD. 1994.
3. McCafferty, W. Patrick. *Aquatic Entomology: The Fishermen's and Ecologists' Illustrated Guide to Insects and Their Relatives*. Boston, MA. Jones and Bartlett Publishers, Inc. 1981.
4. Bailey, Paul and Lea Beazley. *New River Residents*. North Carolina State Parks.

# AT HOME IN THE RIVER

## Post-Visit Activity

<b>Activity</b>	<b>Water Journal</b>
<b>Setting</b>	Homework or Classroom
<b>Duration</b>	30 minutes
<b>Subject Area</b>	Language Arts, Writing
<b>Skills</b>	Thinking, Writing, Sentence structure
<b>Grade Level</b>	6-8

### Objectives:

Students will be able to:

1. keep a log of what they are learning about water resources
2. express their feelings about water resources
3. describe how they can integrate what they have learned in the water resource curriculum into their personal lives

### WV - CSOs:

Language Arts - RLA.O.6.1.06,  
RLA.O.6.2.03, RLA.O.7.2.05,  
RLA.O.8.2.05  
Science - SC.O.6.1.06,  
SC.O.6.2.09, SC.O.7.1.06,  
SC.O.8.1.08, SC.O.8.2.26

### MATERIALS

1. notebook or writing pad
2. pen

### BACKGROUND

The water journal allows students an opportunity to reflect on and record what they are learning about their water resources. Students can also use the journals to express their personal thoughts and feeling about Earth's water resources and how their lives are impacted by what happens to the water around them.

This activity is most effective if conducted at the end of the week. Other activities within the unit will be completed and students can incorporate the information learned through all the activities into thoughtful writings.

Students should be encouraged to follow proper writing styles, sentence structure, and grammar when making entries in their journals.

### PROCEDURES

1. Have each student create their own journal to permit personal style and creativity.
2. Have students write daily or weekly to record their thoughts on the day or week's water resource program and related activities.



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## NOTES

## PROCEDURES *continued*

3. Have students address the following items when recording their thoughts:
  1. What concepts did he/she learn from this week's water resource program and activities.
  2. Which of the water resource activities did he/she enjoy and why.
  3. From what I learned this week, I can have a positive impact on our water resources by making these changes in my personal life.

### NOTE:

Have students fill up the front and back of each page with their writings (they do not have to start a new page for each entry.) This will save paper.

## EVALUATION

Periodically evaluate and grade each student's journal based on content, sentence structure and grammar.

## EXTENSION

Encourage students to integrate self-expression and creativity in their journals through poetry, song writing, art work or an article for a newspaper.



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# AT HOME IN THE RIVER

## Post-Visit Activity

<b>Activity</b>	<b>Macro Memory</b>
<b>Setting</b>	Classroom
<b>Duration</b>	30-45 minutes
<b>Subject Area</b>	Science
<b>Skills</b>	Memory, Matching,
<b>Grade Level</b>	6-8

### Objectives:

Students will be able to:

1. name some of the macro-invertebrates that live in the New River
2. identify one or two characteristics or adaptations of these aquatic species

### WV-CSOs:

Science - SC.O.6.1.08,  
SC.O.7.1.08, SC.O.8.3.01

### MATERIALS

1. copy of the Macro Memory game cards

### BACKGROUND

This activity assists students in learning some of the unique characteristics and adaptations that macro-invertebrates have developed for life in the water. Each organism has developed characteristics and adaptations that help them survive in a particular niche within an aquatic habitat.

The activity is a memory game where students must match characteristic or adaptation clues for an aquatic species.

### PROCEDURES

1. Photocopy (on construction paper) game cards and cut them out like a deck of playing cards.
2. Game can be played by 2-4 students at a time.
3. Shuffle the cards and spread them out (face down) on a table or desk.
4. One student turns over a card then turns over another one. If the characteristic or adaptation clue (s) on the cards match the player keeps the pair of cards and takes another turn.



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## NOTES

## PROCEDURES continued

5. If the clue (s) on the two cards do not match, the student turns both cards face down and the next student takes a turn.
6. Continue playing until all matches are collected.
7. The student with the most matches wins the game.

## EVALUATION

Quiz students on some of the characteristics and adaptations for several of the aquatic macro invertebrates.



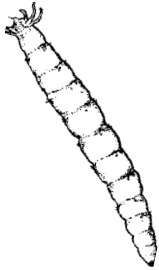




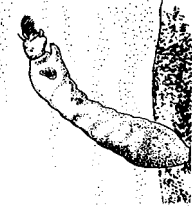

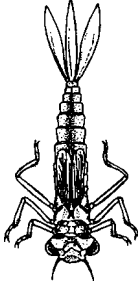

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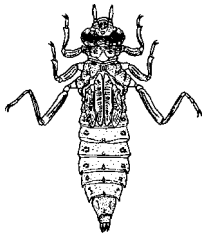
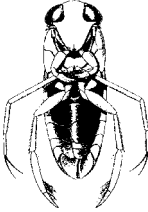
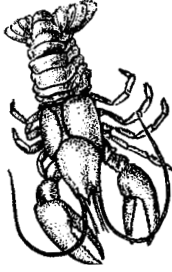




## Macro Memory — Game Cards

**Directions** copy and cut apart a set for use by the class

 <ul style="list-style-type: none"> <li>• Larva breath through the surface of its soft body.</li> <li>• Adults are mosquito-like flies with extremely long legs.</li> </ul> <p>Crane fly larva</p>	 <ul style="list-style-type: none"> <li>• Larva breath through the surface of its soft body.</li> <li>• Adults are mosquito-like flies with extremely long legs.</li> </ul> <p>Crane fly adult</p>
  <ul style="list-style-type: none"> <li>• Larva live in a protective structure built of tiny rocks and plant material.</li> <li>• Adults are moth-like insects with two pairs of hairy wings.</li> </ul> <p>Caddisfly larva</p>	 <ul style="list-style-type: none"> <li>• Larva live in a protective structure built of tiny rocks and plant material.</li> <li>• Adults are moth-like insects with two pairs of hairy wings.</li> </ul> <p>Caddisfly adult</p>
 <ul style="list-style-type: none"> <li>• Larva attach to rocks with a safety line.</li> <li>• Adult females are biting pests during daylight hours.</li> </ul> <p>Black fly larva</p>	 <ul style="list-style-type: none"> <li>• Larva attach to rocks with a safety line.</li> <li>• Adult females are biting pests during daylight hours.</li> </ul> <p>Black fly adult</p>
 <ul style="list-style-type: none"> <li>• Nymphs have broad oar-like breathing gills (fins) that look like tails.</li> <li>• Adults are very colorful insects.</li> </ul> <p>Damselfly nymph</p>	 <ul style="list-style-type: none"> <li>• Nymphs have broad oar-like breathing gills (fins) that look like tails.</li> <li>• Adults are very colorful insects.</li> </ul> <p>Damselfly adult</p>

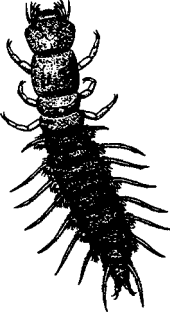
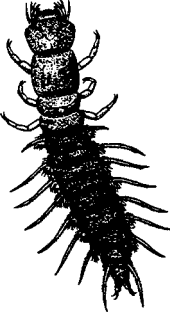
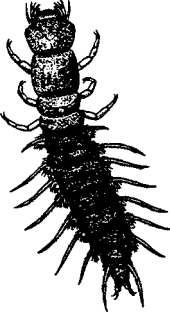
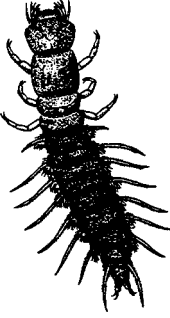
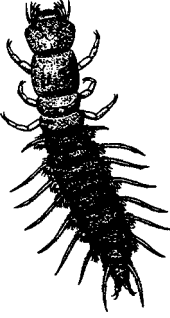
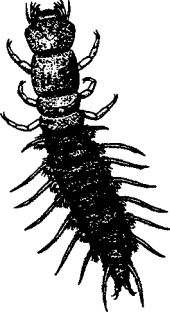
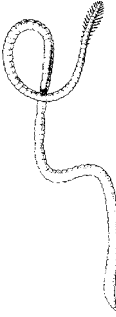
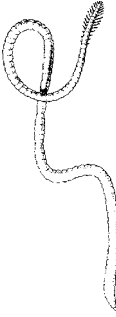
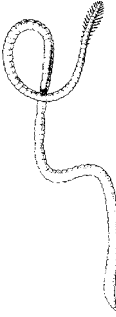
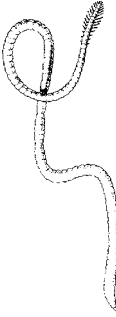
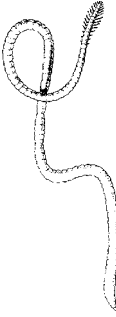
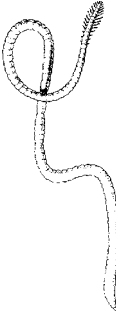


















# AT HOME IN THE RIVER

## Macro Memory — Game Cards

	<ul style="list-style-type: none"> <li>• It will prey on small fish many times bigger than itself.</li> <li>• Adult males will carry up to 100 eggs glued to its back.</li> </ul>	<p>Giant Water Bug Immature</p>		<ul style="list-style-type: none"> <li>• Nymphs move by expelling water from its body.</li> <li>• Adults are voracious predators and commonly called "mosquito hawks".</li> </ul>	<p>Dragonfly nymph</p>		<ul style="list-style-type: none"> <li>• It has oarlike legs with swimming hairs for moving through water.</li> <li>• It is lighter than water.</li> </ul>	<p>Water Boatman</p>		<ul style="list-style-type: none"> <li>• Pinchers on the first two legs are used for defense and to crush food.</li> <li>• Females may carry up to 700 tiny eggs under her abdomen.</li> </ul>	<p>Crayfish</p>
	<ul style="list-style-type: none"> <li>• It will prey on small fish many times bigger than itself.</li> <li>• Adult males will carry up to 100 eggs glued to its back.</li> </ul>	<p>Giant Water Bug adult</p>		<ul style="list-style-type: none"> <li>• Nymphs move by expelling water from its body.</li> <li>• Adults are voracious predators and commonly called "mosquito hawks".</li> </ul>	<p>Dragonfly adult</p>		<ul style="list-style-type: none"> <li>• It has oarlike legs with swimming hairs for moving through water.</li> <li>• It is lighter than water.</li> </ul>	<p>Water Boatman</p>		<ul style="list-style-type: none"> <li>• Pinchers on the first two legs are used for defense and to crush food.</li> <li>• Females may carry up to 700 tiny eggs under her abdomen.</li> </ul>	<p>Crayfish</p>

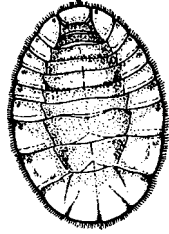

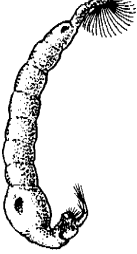





# AT HOME IN THE RIVER

## Macro Memory — Game Cards

 <ul style="list-style-type: none"> <li>• Larva has large jaws designed to eat other insects.</li> <li>• Adults only live a few days and are the largest aquatic insect in the U.S.</li> </ul> <p>Hellgrammite (Dobsonfly larva)</p>	 <ul style="list-style-type: none"> <li>• Larva has large jaws designed to eat other insects.</li> <li>• Adults only live a few days and are the largest aquatic insect in the U.S.</li> </ul> <p>Hellgrammite (Dobsonfly larva)</p>	 <ul style="list-style-type: none"> <li>• Larva has large jaws designed to eat other insects.</li> <li>• Adults only live a few days and are the largest aquatic insect in the U.S.</li> </ul> <p>Hellgrammite (Dobsonfly larva)</p>	 <ul style="list-style-type: none"> <li>• Larva has large jaws designed to eat other insects.</li> <li>• Adults only live a few days and are the largest aquatic insect in the U.S.</li> </ul> <p>Hellgrammite (Dobsonfly larva)</p>	 <ul style="list-style-type: none"> <li>• Larva has large jaws designed to eat other insects.</li> <li>• Adults only live a few days and are the largest aquatic insect in the U.S.</li> </ul> <p>Hellgrammite (Dobsonfly larva)</p>	 <ul style="list-style-type: none"> <li>• Larva has large jaws designed to eat other insects.</li> <li>• Adults only live a few days and are the largest aquatic insect in the U.S.</li> </ul> <p>Hellgrammite (Dobsonfly larva)</p>
 <ul style="list-style-type: none"> <li>• They can grow to a length of 100 mm.</li> <li>• They can live in oxygen-poor environments.</li> </ul> <p>Aquatic Worm</p>	 <ul style="list-style-type: none"> <li>• They can grow to a length of 100 mm.</li> <li>• They can live in oxygen-poor environments.</li> </ul> <p>Aquatic Worm</p>	 <ul style="list-style-type: none"> <li>• They can grow to a length of 100 mm.</li> <li>• They can live in oxygen-poor environments.</li> </ul> <p>Aquatic Worm</p>	 <ul style="list-style-type: none"> <li>• They can grow to a length of 100 mm.</li> <li>• They can live in oxygen-poor environments.</li> </ul> <p>Aquatic Worm</p>	 <ul style="list-style-type: none"> <li>• They can grow to a length of 100 mm.</li> <li>• They can live in oxygen-poor environments.</li> </ul> <p>Aquatic Worm</p>	 <ul style="list-style-type: none"> <li>• They can grow to a length of 100 mm.</li> <li>• They can live in oxygen-poor environments.</li> </ul> <p>Aquatic Worm</p>
 <ul style="list-style-type: none"> <li>• They possess anterior and posterior suckers used for feeding and movement.</li> <li>• Many of these creatures are patterned and brightly colored.</li> </ul> <p>Leech</p>	 <ul style="list-style-type: none"> <li>• They possess anterior and posterior suckers used for feeding and movement.</li> <li>• Many of these creatures are patterned and brightly colored.</li> </ul> <p>Leech</p>	 <ul style="list-style-type: none"> <li>• They possess anterior and posterior suckers used for feeding and movement.</li> <li>• Many of these creatures are patterned and brightly colored.</li> </ul> <p>Leech</p>	 <ul style="list-style-type: none"> <li>• They possess anterior and posterior suckers used for feeding and movement.</li> <li>• Many of these creatures are patterned and brightly colored.</li> </ul> <p>Leech</p>	 <ul style="list-style-type: none"> <li>• They possess anterior and posterior suckers used for feeding and movement.</li> <li>• Many of these creatures are patterned and brightly colored.</li> </ul> <p>Leech</p>	 <ul style="list-style-type: none"> <li>• They possess anterior and posterior suckers used for feeding and movement.</li> <li>• Many of these creatures are patterned and brightly colored.</li> </ul> <p>Leech</p>
 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly nymph</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly nymph</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly nymph</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly nymph</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly nymph</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly nymph</p>
 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly adult</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly adult</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly adult</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly adult</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly adult</p>	 <ul style="list-style-type: none"> <li>• Nymphs breath through gills located outside it's body.</li> <li>• Adults are nonfeeding and live less than a month.</li> </ul> <p>Mayfly adult</p>




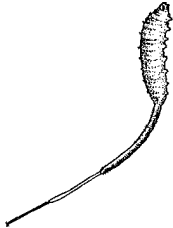




# AT HOME IN THE RIVER

## Macro Memory — Game Cards

 <ul style="list-style-type: none"> <li>• Larva have a streamlined body shape and are adapted to cling to rocks.</li> <li>• Adults are not aquatic but live on rocks and land above the waterline.</li> </ul>	 <ul style="list-style-type: none"> <li>• Larva use a breathing tube to reach air.</li> <li>• Adult females are blood feeders.</li> </ul>	 <ul style="list-style-type: none"> <li>• Larva are found in habitats with little available dissolved oxygen.</li> <li>• Adults do not feed and only live a few days.</li> </ul>	 <ul style="list-style-type: none"> <li>• Nymphs create a current to direct more oxygen toward its body.</li> <li>• Adults are imitated as artificial lures for fly fishing.</li> </ul>
 <ul style="list-style-type: none"> <li>• Larva have a streamlined body shape and are adapted to cling to rocks.</li> <li>• Adults are not aquatic but live on rocks and land above the waterline.</li> </ul>	 <ul style="list-style-type: none"> <li>• Larva use a breathing tube to reach air.</li> <li>• Adult females are blood feeders.</li> </ul>	 <ul style="list-style-type: none"> <li>• Larva are found in habitats with little available dissolved oxygen.</li> <li>• Adults do not feed and only live a few days.</li> </ul>	 <ul style="list-style-type: none"> <li>• Nymphs create a current to direct more oxygen toward its body.</li> <li>• Adults are imitated as artificial lures for fly fishing.</li> </ul>










# AT HOME IN THE RIVER

## Macro Memory — Game Cards

 <ul style="list-style-type: none"> <li>• Larva possess chewing mouthparts.</li> <li>• Adults can see above and below the water at the same time.</li> </ul> <p>Whirligig Beetle larva</p>	 <ul style="list-style-type: none"> <li>• Larva will engage in a form of "push-ups" to move more oxygen over its body.</li> <li>• Adults and larva have two tails.</li> </ul> <p>Stonefly nymph</p>	 <ul style="list-style-type: none"> <li>• Larva live on the rocky bottom on riffles and rapids within a stream.</li> <li>• They are important indicators of water quality.</li> </ul> <p>Riffle Beetle larva</p>	 <ul style="list-style-type: none"> <li>• Larva use a breathing tube (a tail-like structure) for reaching air.</li> <li>• Adults are brightly colored and patterned.</li> </ul> <p>Rat-tailed Maggot larva</p>
 <ul style="list-style-type: none"> <li>• Larva possess chewing mouthparts.</li> <li>• Adults can see above and below the water at the same time.</li> </ul> <p>Whirligig Beetle adult</p>	 <ul style="list-style-type: none"> <li>• Larva will engage in a form of "push-ups" to move more oxygen over its body.</li> <li>• Adults and larva have two tails.</li> </ul> <p>Stonefly adult</p>	 <ul style="list-style-type: none"> <li>• Larva live on the rocky bottom on riffles and rapids within a stream.</li> <li>• They are important indicators of water quality.</li> </ul> <p>Riffle Beetle adult</p>	 <ul style="list-style-type: none"> <li>• Larva use a breathing tube (a tail-like structure) for reaching air.</li> <li>• Adults are brightly colored and patterned.</li> </ul> <p>Rat-tailed Maggot adult</p>

# AT HOME IN THE RIVER

## Macro Memory — Game Cards

 <ul style="list-style-type: none"> <li>• They have feet that feel the vibrations of other creatures in the water.</li> <li>• Adults inject chemicals to dissolve the internal body parts of its prey.</li> </ul> <p>Water Strider immature</p>	 <ul style="list-style-type: none"> <li>• This animal prefers to eat decaying matter.</li> <li>• It has seven pairs of legs with the first pair adapted for grasping.</li> </ul> <p>Aquatic Sowbug</p>	 <ul style="list-style-type: none"> <li>• Organism has seven pairs of legs with the first two pairs modified for grasping.</li> </ul> <p>Scud</p>	 <ul style="list-style-type: none"> <li>• Larva emit silk for use in constructing cases, nets and cocoons.</li> </ul>  <p>Caddisfly larva</p>
 <ul style="list-style-type: none"> <li>• They have feet that feel the vibrations of other creatures in the water.</li> <li>• Adults inject chemicals to dissolve the internal body parts of its prey.</li> </ul> <p>Water Strider adult</p>	 <ul style="list-style-type: none"> <li>• This animal prefers to eat decaying matter.</li> <li>• It has seven pairs of legs with the first pair adapted for grasping.</li> </ul> <p>Aquatic Sowbug</p>	 <ul style="list-style-type: none"> <li>• Organism has seven pairs of legs with the first two pairs modified for grasping.</li> </ul> <p>Scud</p>	 <ul style="list-style-type: none"> <li>• Larva emit silk for use in constructing cases, nets and cocoons.</li> </ul> <p>Caddisfly adult</p>

# AT HOME IN THE RIVER

## Post-Visit Activity

<b>Activity</b>	<b>Water Monitoring</b>
<b>Setting</b>	Classroom or along a river or stream
<b>Duration</b>	1 hour
<b>Subject Area</b>	Science and Math
<b>Skills</b>	Data collection, Recording, Graphing, Technical equipment use
<b>Grade Level</b>	6-8

### Objectives:

Students will be able to:

1. perform several water quality tests
2. collect and record data about water quality
3. chart data on a graph

### WV-CSOs:

Math - M.O.6.5.1, M.O.7.5.3,  
M.O.8.5.3

Science - SC.O.6.1.06,  
SC.O.6.1.08, SC.O.6.1.09,  
SC.O.6.1.11, SC.O.6.1.12,  
SC.O.6.2.09, SC.O.6.2.12,  
SC.O.7.1.06, SC.O.7.1.08,  
SC.O.7.1.09, SC.O.7.1.11,  
SC.O.7.1.12, SC.O.7.2.14,  
SC.O.8.1.04, SC.O.8.1.05,  
SC.O.8.1.06, SC.O.8.1.08,  
SC.O.8.2.26

### MATERIALS

Refer to the equipment and materials list for this activity found in the "Water Monitoring" Unit

### BACKGROUND

Water quality is affected directly and indirectly by everything that happens within a watershed. Activities including logging, construction, agriculture, industry, and mining can have a significant impact on the quality of water within the watershed. Water quality is also affected by the daily activities of individuals, neighborhoods, towns, and communities.

Monitoring water quality is necessary in establishing baseline conditions within a river or stream. It also provides a way to determining significant changes and problems, temporary or long-term, in water quality.

This activity allows students to perform several water quality tests on samples taken from a local stream or river. They will collect data, record their findings, graph the data, and track their findings over several weeks to determine the quality of the water being tested. At the end of this data gathering period, they should be able to note any temporary changes that have occurred in the stream or river.

### PROCEDURES

Procedures to conduct this activity can be found in the "Water Monitoring" Unit.



New River Gorge National River